



Waste Inspection Tomography (WIT)



Developer: Bio-Imaging Research, Inc.
Contract Number: DE-AC21-93MC30173
Crosscutting Area: CMST

Mixed Waste
FOCUS AREA

Problem:

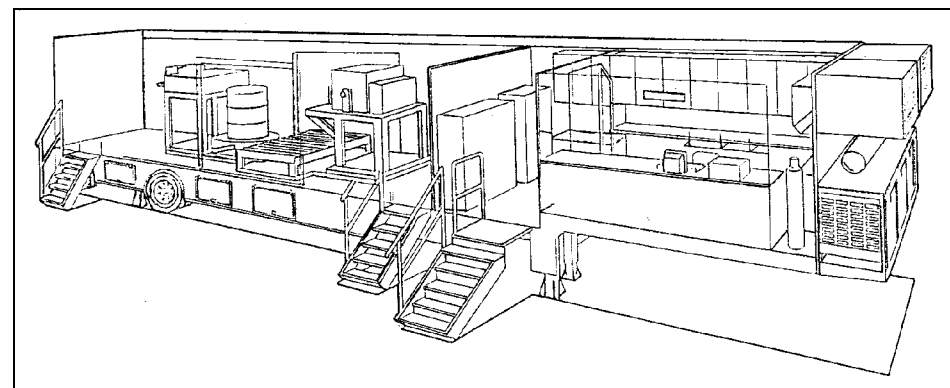
Characterization of the contents of nuclear waste drums is required for disposition decisions, safe transportation, and permanent storage. Movement of waste drums on and off storage sites is regulated for safety and environmental reasons. Examination of drum contents with invasive techniques is expensive because of the safety precautions necessary when handling nuclear waste. Currently used non-destructive techniques such as real time radiography (RTR) lack the capability to identify regulated contents such as free-liquid volume. Thus, characterization of nuclear waste is logistically difficult, expensive, and generally does not provide quantitative results.

Solution:

A mobile waste inspection tomography (WIT) system that can be brought to the waste site to perform tomographic characterization of nuclear waste drums using a multimodality approach. In the WIT system, high-energy computed tomography (CT), emission tomography (ECT) and emission spectroscopy for nondestructive assay (NDA) are integrated on a mobile trailer. WIT

is nondestructive and noninvasive, and produces quantitative results. WIT will safely and cost-effectively identify contents, provide two- and three-dimensional information about contents, locate isotope emissions, and identify the emitting isotope species.

Benefits:



►Rapid characterization of 55-110 gallon drums for radioactive and heavy-metal content and location, wall thickness, and free-liquid volume and location.

►Effective for low-level, transuranic, and mixed wastes in a variety of matrices including cement, glass, polymers, combustibles, loose soil, heterogeneous metals, and super-compacted materials.

►Mobile system optimizes logistics.

►3-D, readily interpreted, near real-time images of drum contents facilitates evaluation, processing, and disposition of drums.

►Archived data and content images support engineering decisions and regulatory compliance.

Technology:

The WIT design provides the following imaging capabilities in a mobile system with reasonable throughput and cost. CT nondestructively quantifies regulated parameters. This includes measurements of drum-wall thickness and free-liquid volume, and identification of heavy-metal densities. CT also identifies drum contents through 2-D and 3-D imaging. ECT can locate emissions within a drum, identifying a point source, a locus of points, or a uniform distribution of emissions.



The following are important features of the WIT system:

► **Drum Handling:** Loading and unloading will be accomplished using site-supplied forklift trucks. Overpack protection for older or breached drums is required.

- ECT: Gamma cameras provide for emission volume imaging to locate emission sources within the drum.

►Spectroscopic Assay: Energy-sensitive NDA reveals the emission

spectrum, identifying the emitting isotopic species. Capability for active and passive CT is also provided to allow validation of the system. Lawrence Livermore National Laboratory is developing this technology application under a separate agreement.

►Archive Storage: Optical disk storage of digitized images and raw data, as well as VCR recording of operator review protocols, are provided.

Contacts:

Bio-Imaging Research Inc. is an industrial CT manufacturer and the WIT contractor for the Department of Energy (DOE). For information on this project, the contractor contact is:

Principal Investigator:
Mr. Richard T. Bernardi
Bio-Imaging Research, Inc.
425 Barclay Boulevard
Lincolnshire, IL 60069
Phone: (847) 634-6425
Fax: (847) 634-6440
E-mail: None
DOE's Federal Energy Technology
Center supports the Environmental

Management - Office of Science and Technology by contracting the research and development of new technologies for waste site characterization and cleanup. For information regarding this project, the DOE contact is:

DOE Project Manager:
Mr. P. Steven Cooke
Federal Energy Technology Center
3610 Collins Ferry Road
P.O. Box 880
Morgantown, WV 26507-0880
Phone: (304) 285-5437
Fax: (304) 285-4403
E-mail: pcooke@fetc.doe.gov

